

# **E907 Experimental Status**

**A.Norman, E907 Collaboration**

**20, December 2004**

## **FNAL E907 Collaboration**

M.Austin, R.J.Peterson

*University of Colorado, Boulder, Colorado 80309*

W.Baker, D.Carey, J.Hylen, C.Johnstone, M.Kostin, H.Meyers, N.Mokhov,  
A.Para, R.Raja, S.Stringanov

*Fermi National Accelerator Laboratory, Batavia Illinois 60510*

G.Feldman, A.Lebedev, S.Seun

*Harvard University, Cambridge, Massachusetts 02138*

P.Hanlet, O.Kamaev, D.Kaplan, H.Rubin, N.Solomey, C.White

*Illinois Institute of Technology, Chicago, Illinois 60616*

U.Akgun, G.Aydin, F.Duru, Y.Gunyadin, Y.Onel, A.Penzo

*University of Iowa, Iowa City, Iowa 52242*

N.Graf, M.Messier, J.Paley

*Indiana University, Bloomington, Indiana 47405*

P.D.Barnes Jr., E.Hartouni, M.Heffner, D.Lange, R.Soltz, D.Wright

*Lawrence Livermore Laboratory, Livermore, California 94551*

R.L.Abrams, H.R.Gustafson, M.Longo, H-K.Park, D.Rajaram

*University of Michigan, Ann Arbor, Michigan 48109*

A.Bujak, L.Gutay, D.E.Miller

*Purdue University, West Lafayette, Indiana 47907*

T.Bergfeld, A.Godley, S.R.Mishra, C.Rosenfeld, K.Wu

*University of South Carolina, Columbia, South Carolina 29208*

C.Dukes, H.Lane, L.C.Lu, C.Materniak, K.Nelson, A.Norman

*University of Virginia, Charlottesville, Virginia 22904*

## **Introduction**

- Spectrometer Commissioning
- Beamline Commissioning
- Further Tasks
- Timeline

## Spectrometer Commissioning

During the past week, from 13Dec-20Dec commissioning of the E907 (MiPP) spectrometer continued.

During this period detector subsystems were checked out in order to finalize out standing issues from the Aug '04 run period. In particular:

- Two trim magnets and the trigger timing counter T-00 were swapped in the MC6 beamline enclosure to provide the intended configuration and shielding of the timing counter. (More on this later)
- Beam Chambers 1-3 certified and debugged. All planes and front end electronics repaired/debugged. Faulty backplane replaced on a custom discriminator crate. See Fig. 1 for current beam profiles.
- Beam Tagging Čerenkov operation verified at standard operating pressures at incident beam momenta 5, 20, 40GeV/c.
- PID tagging triggers checked out for electron, muon, pion, kaon and

proton operation between 5 and 40 GeV/c. Studies continue on efficiencies and tagging purities.

- TPC wire repair completed. One field shaping wire and one anode wire removed.
- Drift Chamber frontend electronics debug continued. Currently only one segment of 32 wires out of the roughly 8000 wires are malfunctioning. The problem appears to be a short on the 5.2V line of a discriminator. See Fig. 3 for current beam profiles.
- 96 cell Čerenkov counter filled with  $C_4F_{10}$  (this is the \$\$\$ gas). Further debug performed on the frontend electronics. Counter timed in. Lead rate on the primary volume is currently being measured.
- Large aperture proportional chambers brought to voltage under Argon/CO<sub>2</sub> for electronics debug. Six of 8 planes continue to show improvement under debug.
- RICH counter re-certified for operation by FNAL safety. Counter

brought on 12:01am on the 18th. See Fig. 9 for plots of Rings.

- E&M Calorimeter under calibration using the tagged 5GeV electron beam.
- Hadron Calorimeter under calibration using the tagged 5GeV muon beam.

*Substantial progress has been made on each and every detector subsystem but there is still more work to do. Calibrations, Systematic studies, and fine tuned debugs are still in progress and will continue on pace barring unforeseen setbacks*

# Beam Chamber 1 Profiles

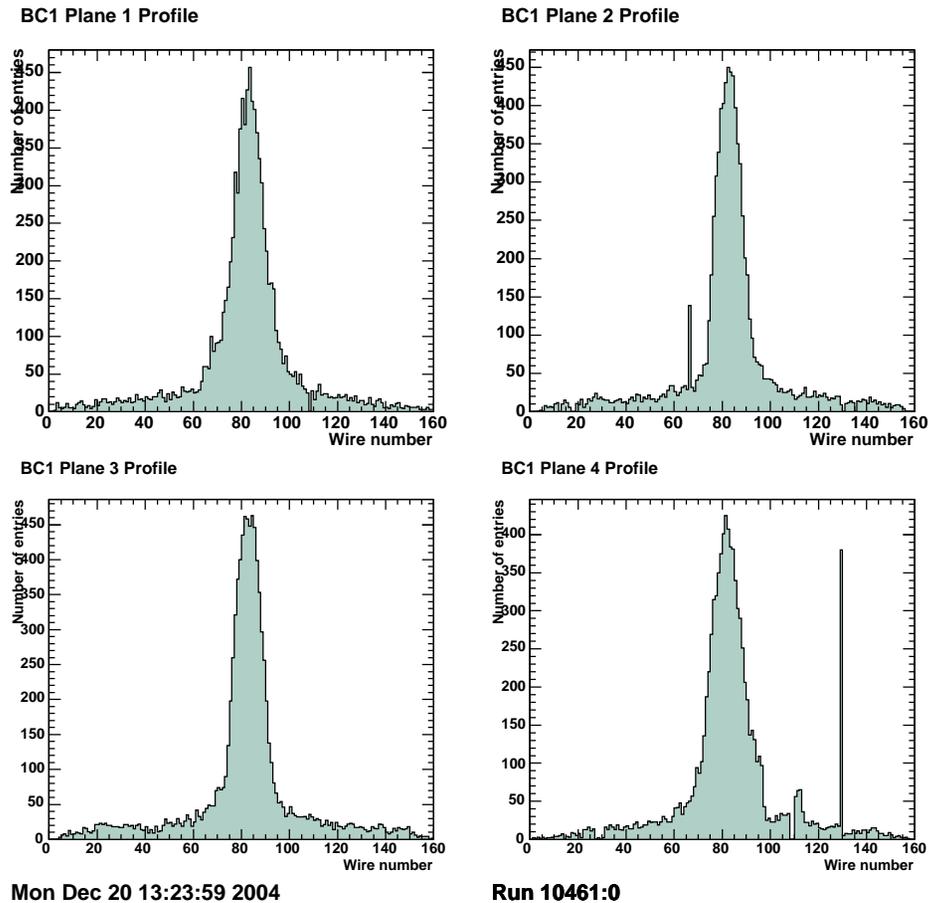


FIG. 1: Beam Chamber 1 Profiles (5 GeV Electron Beam)

## Beam Chamber 2 Profiles

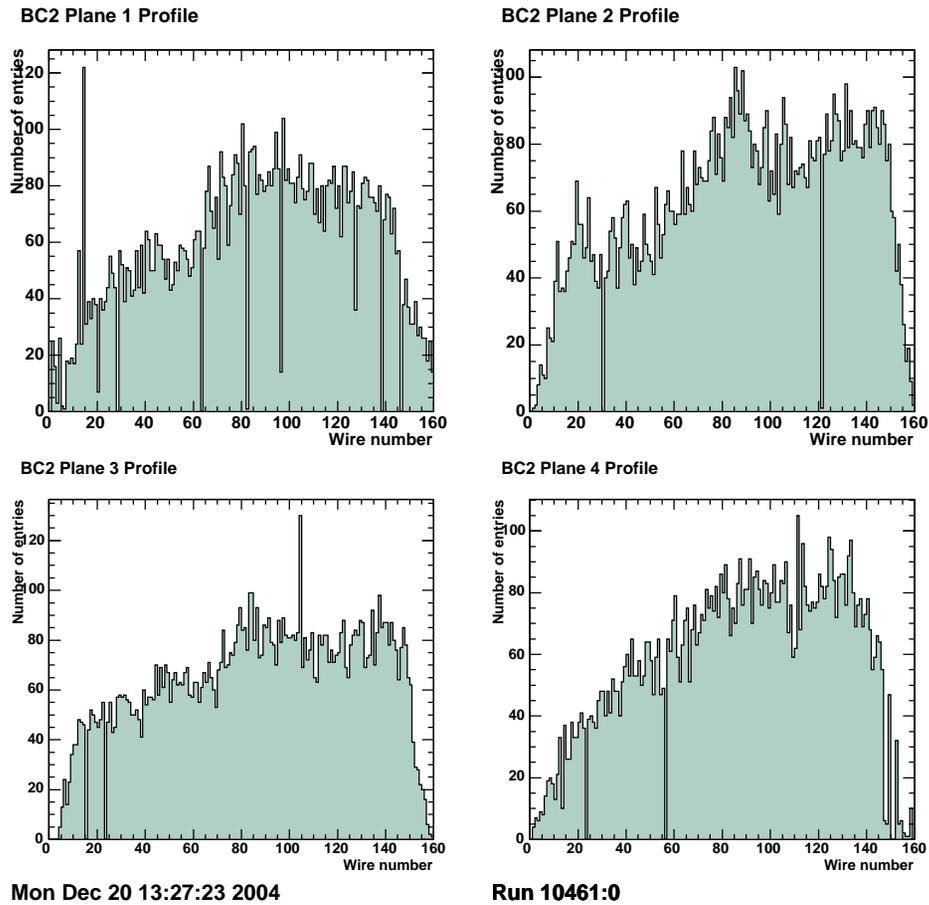


FIG. 2: Diffuse Beam Chamber 2 Profiles (5 GeV Electron Beam)

# Drift Chamber Profiles

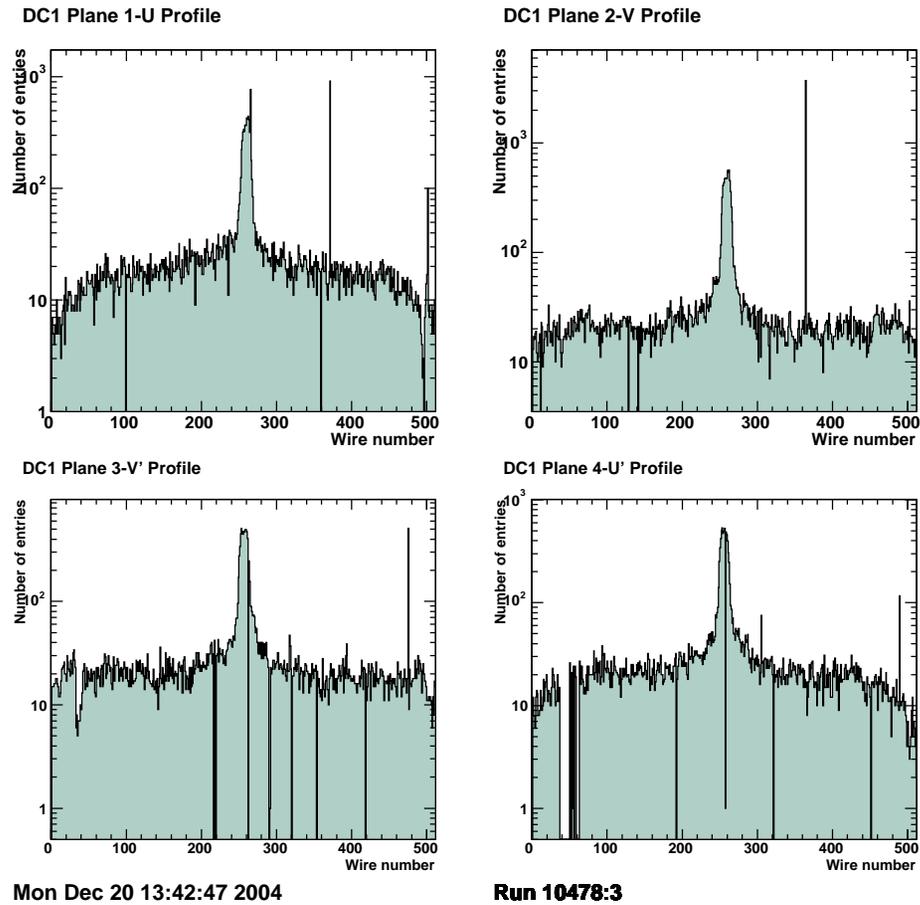


FIG. 3: Drift Chamber Profiles (5 GeV Muon Beam)

# Rich Rings

MIPP (FNAL E907)

Run: 10478  
SubRun: 0  
Event: 213

Mon Dec 20 2004  
01:30:02.124262

Version: 0  
Trigger: 10050001

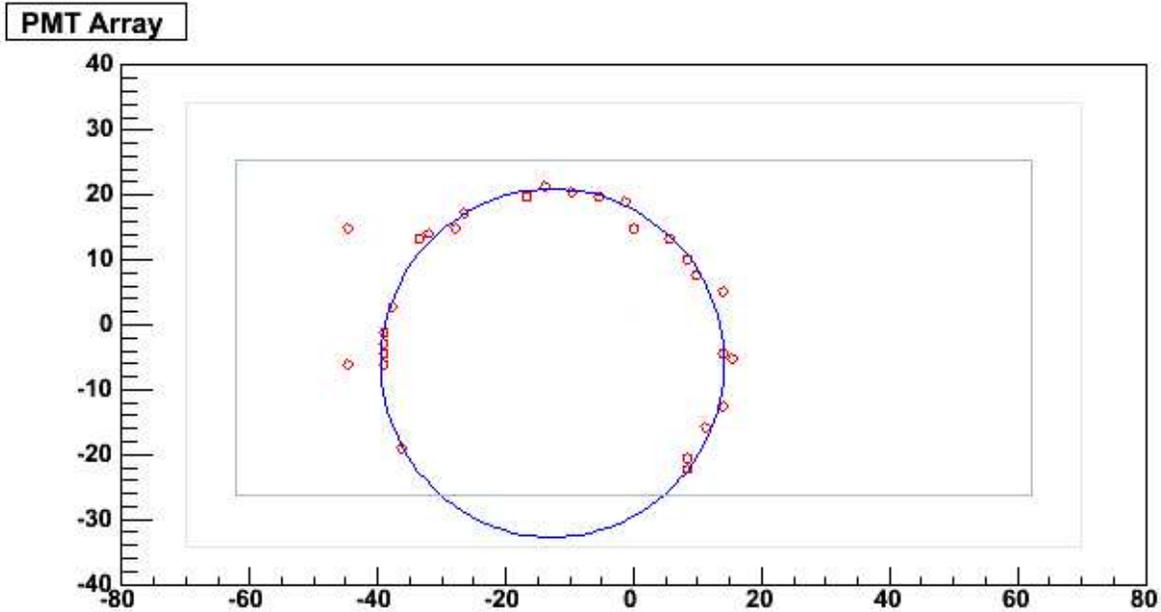


FIG. 4: RICH Electron Rings

# Rich Rings

MIPP (FNAL E907)

Run: 10478  
SubRun: 0  
Event: 46

Mon Dec 20 2004  
01:24:36.809525

Version: 0  
Trigger: 10050001

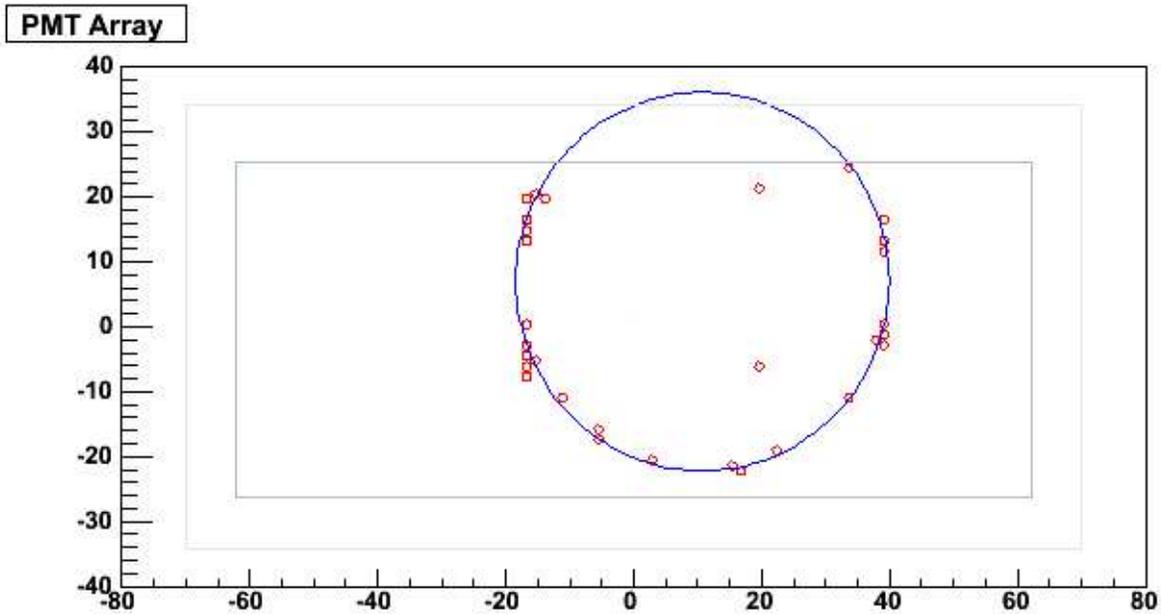


FIG. 5: RICH Electron Rings

# Rich Rings

MIPP (FNAL E907)

Run: 10478  
SubRun: 0  
Event: 91

Mon Dec 20 2004  
01:25:42.149530

Version: 0  
Trigger: 10050001

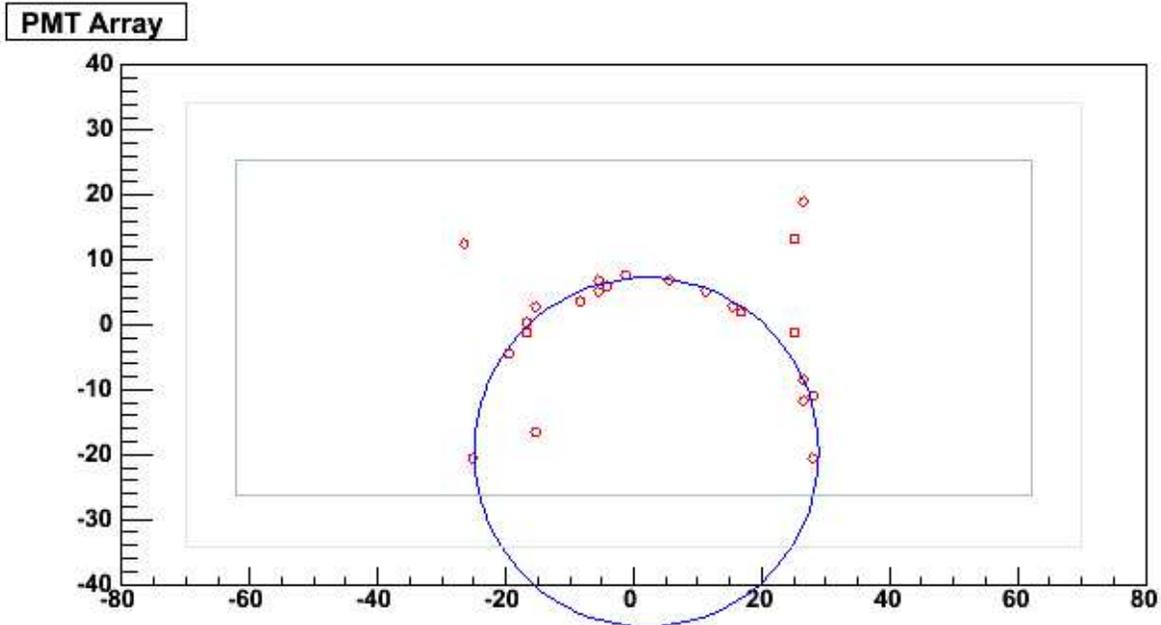


FIG. 6: RICH Electron Rings

# Rich Rings

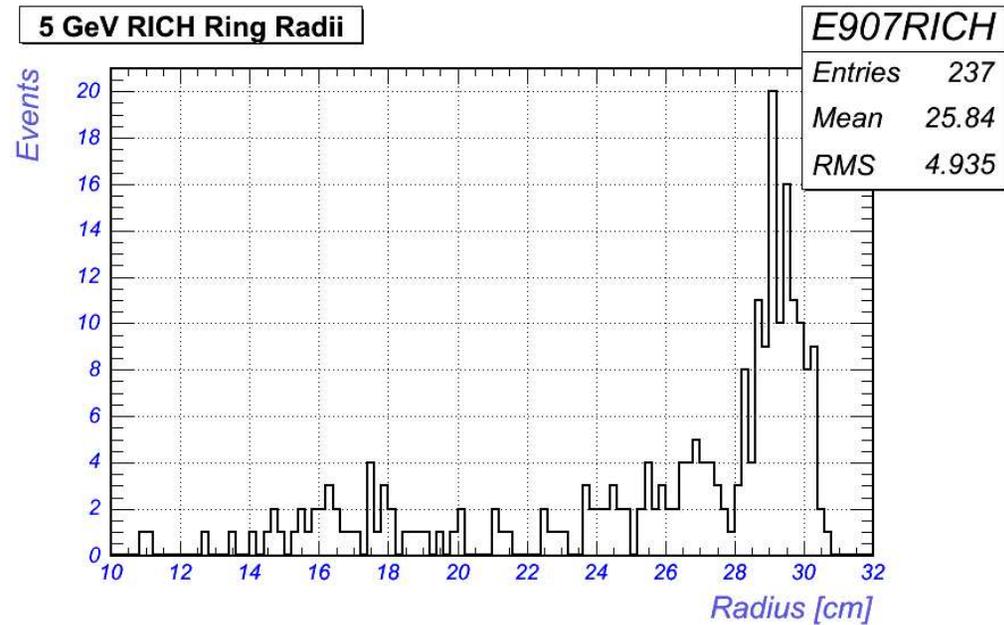


FIG. 7: RICH Ring Radii

## Beam Line Commissioning

The beam line for E907 has continued to be tuned and commissioned over the past week. Tunes have been established at 40, 20 and partially at 5GeV/c.

The beam line commissioning tasks still suffer from spill and duty cycle.

Low energy tunes are resulting in excessive spray and beam halo.

Major items on the beam line commissioning time line:

- Repair of timing counter T-00
- Establish quality low energy tunes (below 20GeV)
- Establish quality high energy tunes (75GeV, etc.)
- Establish negative polarity tunes (to date only positive tunes have been established)
- Perform systematic studies for remaining tunes

# **Beam Tune Studies (40GeV)**

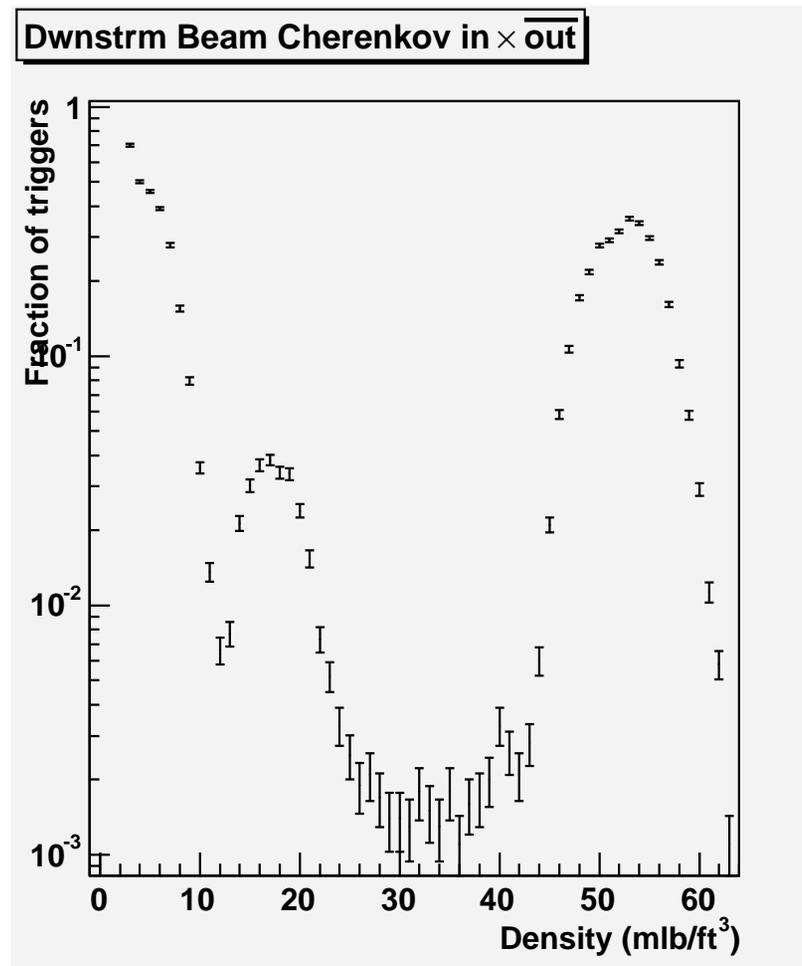


FIG. 8: 40 GeV Particle ID Scan showing pion, kaon and proton peaks

# **Beam Tune Studies (5GeV)**

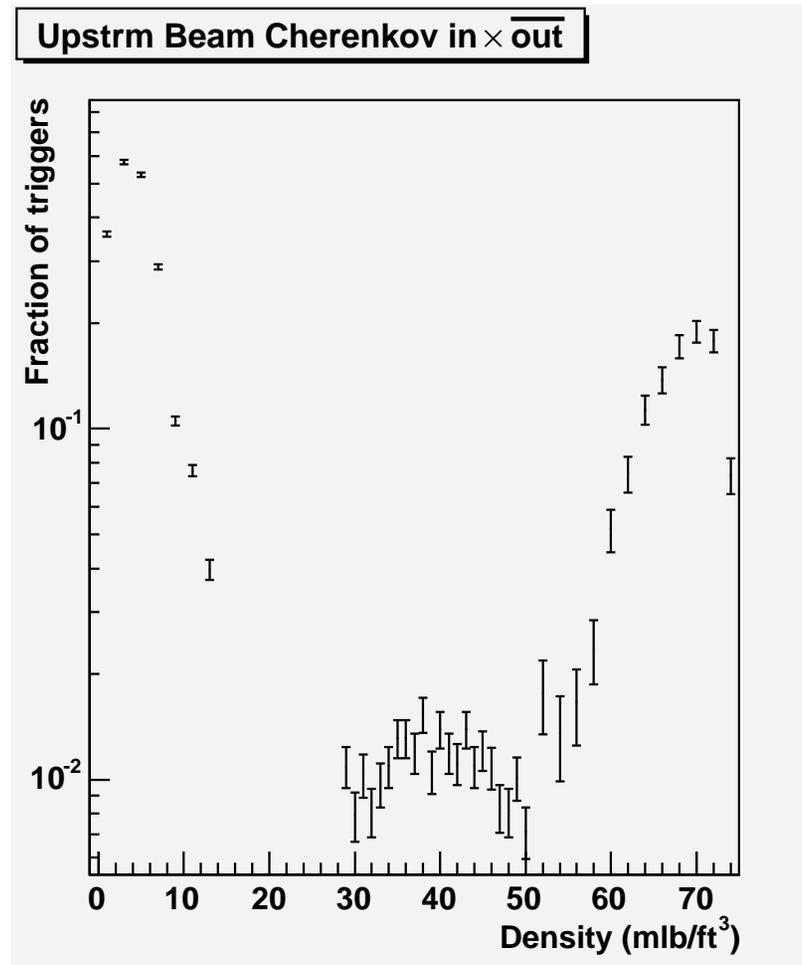


FIG. 9: 5 GeV Particle ID Scan showing electron, muon and pion peaks

## Cryo Target

- Have received approval of the safety committee chaired by Jim Kilmer.
- PORC is being signed for the cryo target to be run in test mode in MC6.
- Still require the signature of Jim Strait and others for testing

After a successful fill with LH<sub>2</sub> the target will be moved to MC7 for installation.

We will require a safety walk-through for AD personnel involved with Search and Secure etc.

*What is required for further progress in beam line commissioning is better duty cycles and extraction to allow to the needed tuning and studies.*

## Outstanding Tasks

While commissioning proceeds there are areas where work is still required. Most of these require a mix of detector and enclosure access as well as quality beam to accomplish.

Primary tasks include:

- Cryo target installation
- Upstream interaction veto counters
- Interaction trigger counters (scint. counter, drift chamber, hodoscope)
- Detector checkouts and calibrations
- Final timing of trigger counters

## TPC Repairs

During the checkout of the TPC after the repairs completed on the 14th, anomalies were detected in the cathode and anode tests.

- The 10kV cathode was found to be sparking across a voltage divider resistor at approximately 7kV.

*The resistor had been bent out of alignment during reassembly of the chamber lid. The resistor was realigned last night and the cathode verified to reach 10kV without any problems.*

- An excessive current draw was measured across anode section #03 during the initial high voltage testing of the detector.

*Anode section #03 wires 5 and 6 showed a short to the ground plane and gating grid caused by a broken adjacent anode wire. Repair of the section was completed at 14:00 today by P.Barnes Jr. of LLNL and C.Materniak of Virginia. They are currently cleaning up the detector for reinsertion into the magnet.*